

Quantum Technologies FET Flagship

Governance

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QT Flagship Governance







Role of QCN – Governance Structure Document

- Page 2 (list and description of governance bodies): we have adapted the suggestions received from several MS since they contribute to clarifying the role of the QCN as part of the governance structure
- Page 7 (Implementing the governance): we have adapted the suggestions received from several MS, which stress the importance of the QCN but leave also room for interaction with other stakeholders



Science & Engineering Board

- Chair: Thierry Debuischert (Thales)
- Vice-Chair: Stephanie Wehner (QuTech)

Strategic Advisory Board

- 16 Independent experts from academia, industry and RTOs
- Chair: Jürgen Mlynek (Humboldt University)

Quantum Community Network

One national representative per MS+AC

SAB members



Industry

- Alfonso Rubio Manzanares , Ametic ES (SMEs, cybersecurity)
- Grzegorz Kasprowicz, CREOTECH PL (Sensing/Metrology)
- Fabio Cavaliere, Ericsson SE (Telecommunication supplier)
- Christoph Sandner, Infineon AT (Microelectronics)
- Jaya Baloo, KPN NL (Telecommunications operator)
- Thierry Botter, Airbus Blue Sky DE (Optoelectronics, Metrology)

Academia and RTOs

- Jürgen Mlynek (chair), Humbold University DE (Experimental physics/Large scale research management)
- Elisabeth Giacobino, Laboratoire Kastler-Brossel FR (Q Communication)
- Vladimir Buzek, Slovak Academy of Sciences SK (Q Communication, Quantum theory)
- **Radu Ionicioiu**, National Institute of Physics and Nuclear Engineering Horia Hulubei RO (Quantum Computation, Quantum Information)
- Maria Luisa Rastello, Istituto Nazionale di Metrologia IT (Metrology)
- Marek Kus, Polish Academy of Sciences PL (Theory Quantum Optics)
- **Ana Sanpera**, Universitat Autònoma de Barcelona ES (Quantum Information Theory, Quantum Simulation)
- Wim van Saarloos, Netherlands Organisation for Scientific Research NL (Condensed matter physics)
- **Daniel Esteve** CEA FR (Quantum effects in electrical circuits)
- *Peter Loosen* Fraunhofer DE (Nanophotonic)



- What should be the new roadmap of the QT Flagship?
- How to ensure continuity with ramp-up phase, while being open?
- How to ensure strategic digital autonomy of the Union (e.g. by manufacturing QT in Europe)?
- What would be the right structure for the implementation phase of the Flagship? Which complementarity with National Initiatives?
- What should be the INCO strategy?
- What would be the governance for the Flagship under Horizon Europe?
- What are the appropriate legal & financial instruments after the ramp-up phase?
- How do we address the skills/training issue?





Deliverables and time plans

- First meeting on May 23rd, physical meetings 2-4 times/year
- Deliverable 1: Update Strategic Research Agenda (SRA)
- Deliverable 2: Propose Key Performance Indicators (KPIs) for the Flagship's output and impact
- Deliverable 3: regularly report to the Commission and BoF, including contributions from all stakeholders



Needed for Sept/Oct: Roadmap for next decade



International Cooperation

EU/Japan workshop 3 – 4 Sept 2018



EU/Canada

 Analysis of cooperation potential planned

EU/US Position paper

US-EU Cooperation on Quantum Information Science and Quantum Technologies

(QSA/QFLAG)

The US and Europe have been at the forefront of research and development of quantum information science and quantum technologies since the field emerged from \underline{o} (the marriage of quantum physics and information theory a few decades ago. This success has been built on a strong foundation of competition and collaboration that has benefited both the US and the EU. For example, the first proposal for two gubit gates came from European research, while the experimental demonstration was made in the US, and in communication, the first concept of quantum key distribution came out of the US, but the first field demonstration was made in Europe. Strong US-EU collaborations have continued to grow, both informal and through different funding schemes and this spirit of competitive collaboration continues to strengthen both.

Recently, we have seen the launch of strategic research and development efforts that are motivated by the potential for significant impact on our modern, global, digital society. It is this highly inter-connected digital society that includes not only scientists and engineers, but also industry, operating and collaborating across borders. We are also witnessing increasing involvement and investment in QIS from industry, reinforcing the need for a clear and coherent path forward to ensure that US-EU synergies and complementary competencies continue to benefit both. Efforts to reinforce and expand on existing collaboration and cooperation activities and to further foster dialogue will be advantageous in continuing to nurture the global quantum information science research cosystem.

Both the US and EU recognize the importance of basic, fundamental, science in providing a foundation for the technologies and applications emerging from the field. While prototypes and products in the more mature areas of QIS are already becoming available, the less developed areas in QIS are still evolving new platforms, protocols and approaches. There remains broad scope for research and development that could accelerate the development of concepts and technologies, make significant progress on long term ambitions, and provide a cutting-edge environment for training a quantum-smart workforce for the future.

In the following appendix we outline several possible areas and topics for research cooperation that would strengthen the leading role that the US and EU have already established. The focus is currently on longerterm basic-science activities that have historically benefited from competitive and collaborative efforts. These cover the areas of Quantum Communication, Quantum Computing, Quantum Simulation, and Quantum Sensing and Metrology.

QSA/QFLAG CSA Activities (1/2)

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Q-Flag – provides central services to EU Quantum Flagship's Upcoming activities



Quantum Flagship Strategy & Monitoring

- Establish a broad Quantum Community in Europe to support Flagship implementation
- Prepare community based Strategic Research Agenda

Determine Benchmarking for different platforms and underlying technologies

Innovation and Markets: Towards an Engineering and Systems approach

- Identify Research Infrastructure and Prototyping Equipment to connect industry
- Identify QT industry use cases driven by a. ultimate performance and mass markets and applications

QSA/QFLAG CSA Activities (2/2)

European Commission

Q-Flag – provides central services to EU Quantum Flagship **Education Training and Outreach**

Upcoming activities



- Collect and promote QT Education & Training offerings across Europe
- Identify QT training needs and propose new curricula to EC and member states
- Communication: Show future impact of QT to the general public and industry Target: 3 Mio global readership

Member state investments & international benchmarking

- National QT Programme Cooperation: trigger joint investments of Member State funding authorities - beyond ERA-NET Cofund actions
- Benchmarking EU strategy against other world leading economies and trigger cooperation



European Commission

Presidency event in Finland

October 2019

1-2 day event



(QSA/QFLAG)







EQTC February 2019 Grenoble

Main outcomes of 2nd Scientific and Engineering Board (SEB)Meeting

- Interactions with EC: coordination but no micro-management
- QUANTera representatives are full members of SEB
- SEB activities will stay within the QT Flagship projects (e.g. benchmarking) – no extrapolation to QUANTera projects
- Roadmap for benchmarking: 05/19 first version of benchmarking document, will be updated and approved by SEB regularly





Horizon 2020 FET Work Program 2020

Topic: Semi-conductor Quantum computing and Quantum software development

Budget ~19,7 Mio Euro

Topic: CSA on International Cooperation in QT

Budget ~500 000 Euro

Topic: CSA on Education in QT

Budget ~300 000 Euro

Topic: QuantERA II

Budget ~20 Mio Euro

Timeline towards a QT ecosystem

2018

2016

PREPARATORY STEPS

04/2016: Announcement in EU Cloud Initiative 09/2016: Set-up of the QT Flagship High Level Steering Committee Intermediate report (02/2017) Final report (09/2017)

RAMP UP PHASE

+ Flagship Coordination & Support Actions:
0.5 m€ (2017) + 2 m€ (2018)
+ Flagship Research & Innovation Actions: 130 m€ (2018)

2019

QUANT-ERA

+ QuantERA (01/2018): 26 countries, 36 m€ (1/3 EU) + QuantERA II (2020 - tbc): FET call: 10 m€

> + H2020 LEIT ICT QKD Testbed call (2019): 15 m€

2020

FULL IMPLEMENTATION*

+ Series of QT calls

+ EU Quantum Key

Distribution Network

* pending adoption under the next multi-annual framework programme



THANK YOU!



ADDITIONAL SLIDES

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Work Programme topic

Scope (Innovation Actions)

HO

- Build an experimental platform to test and validate the concept of end-to-end security in a metropolitan network
- Identify the practical implementation issues of a communication network going beyond point-to-point links
- Multi-vendor / multi-technology approach
- QKD as a service (justified economically, security, application)





2020

Work Programme topic

HOR

Expected Impact

- Feasibility of Quantum communication networks
- Validation of network technologies, architectures, protocols based on QKD
- Interoperability of quantum and classical networks

2020

• Development of standards for QKD technologies



Retained proposal: OPENQKD, 15 M€ EU funding # BENEFICIARY → € REQUESTED



Expected outputs:

- 4 testbed sites (Europe) with different QKD systems (interoperability)
- > 25 use-cases: Critical infrastructure (smart grid, e-government), Hospitals
- Advancing initiatives for the standardization and certification
- Lay the foundations for a Pan-European Quantum Network





OpenQKD: next phase

Proposal currently under negotiation:

ESR highlighted:

"the participation of partners depending on non-EU holdings in an area of such critical importance for the security of the Union and the Digital Single Market is not addressed in the proposal."

First negotiation meeting with the consortium held on 8 March 2019.

Proposal currently under security scrutiny:

HO

Result of the security scrutiny is expected by Mid-May 2019





2020